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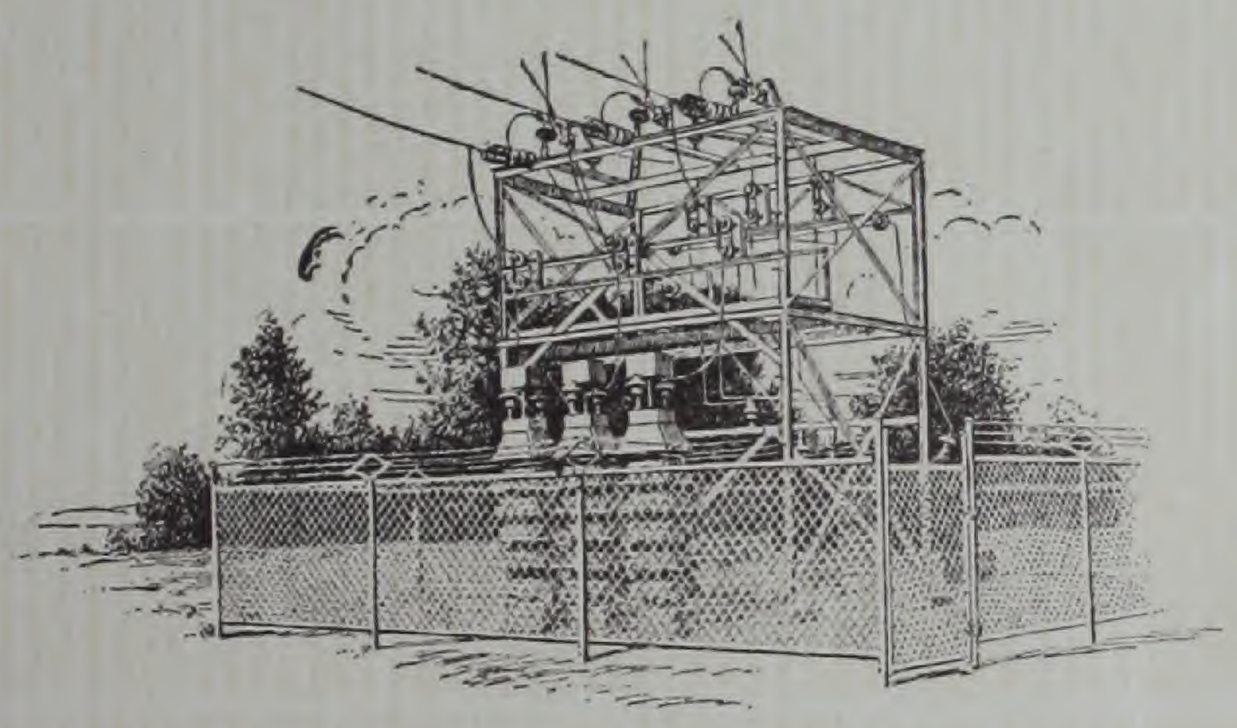
GEA-1029A

OUTDOOR SWITCHING EQUIPMENT

Group-operated, Rotating-insulator, Disconnecting Switches



GENERAL ELECTRIC

OUTDOOR SWITCHING EQUIPMENT

Group-operated, Rotating-insulator, Disconnecting Switches

FOREWORD

In this bulletin, the General Electric Company presents, for the convenience of operating engineers, a concise compilation of information as to group-operated, rotating-insulator, disconnecting switches.

Prices and dimensions given in the various tabulations should be used for estimating purposes only.

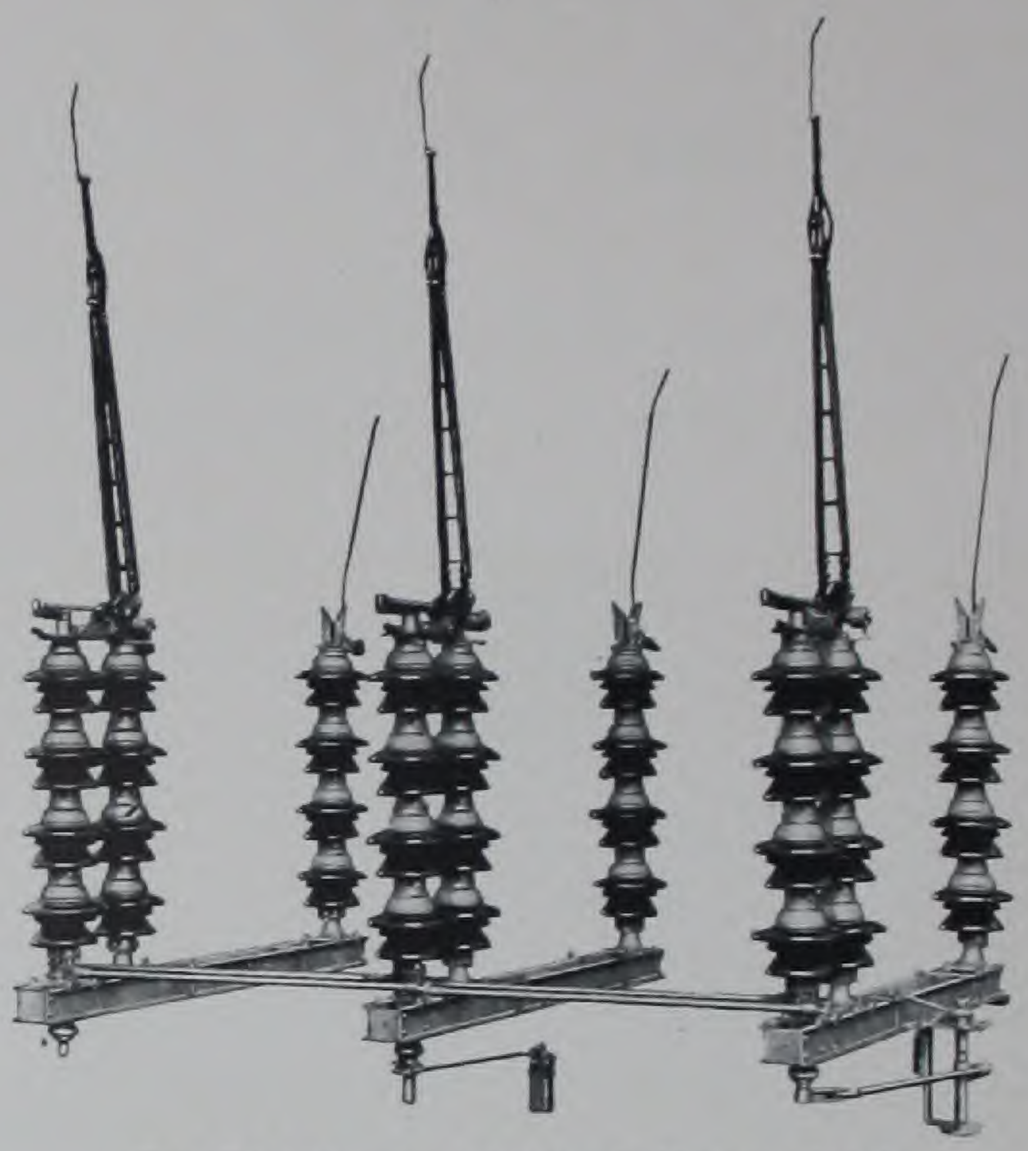
General Electric appreciates the coöperation of the operating companies in the development of durable equipment for exacting service. Its experience of years, in design and manufacture, is at the service of all who are interested in outdoor switching equipment.

All communications should be addressed to the Outdoor Switching Equipment Division, Switchgear Department, General Electric Company, 6901 Elmwood Ave., Philadelphia, Pa.

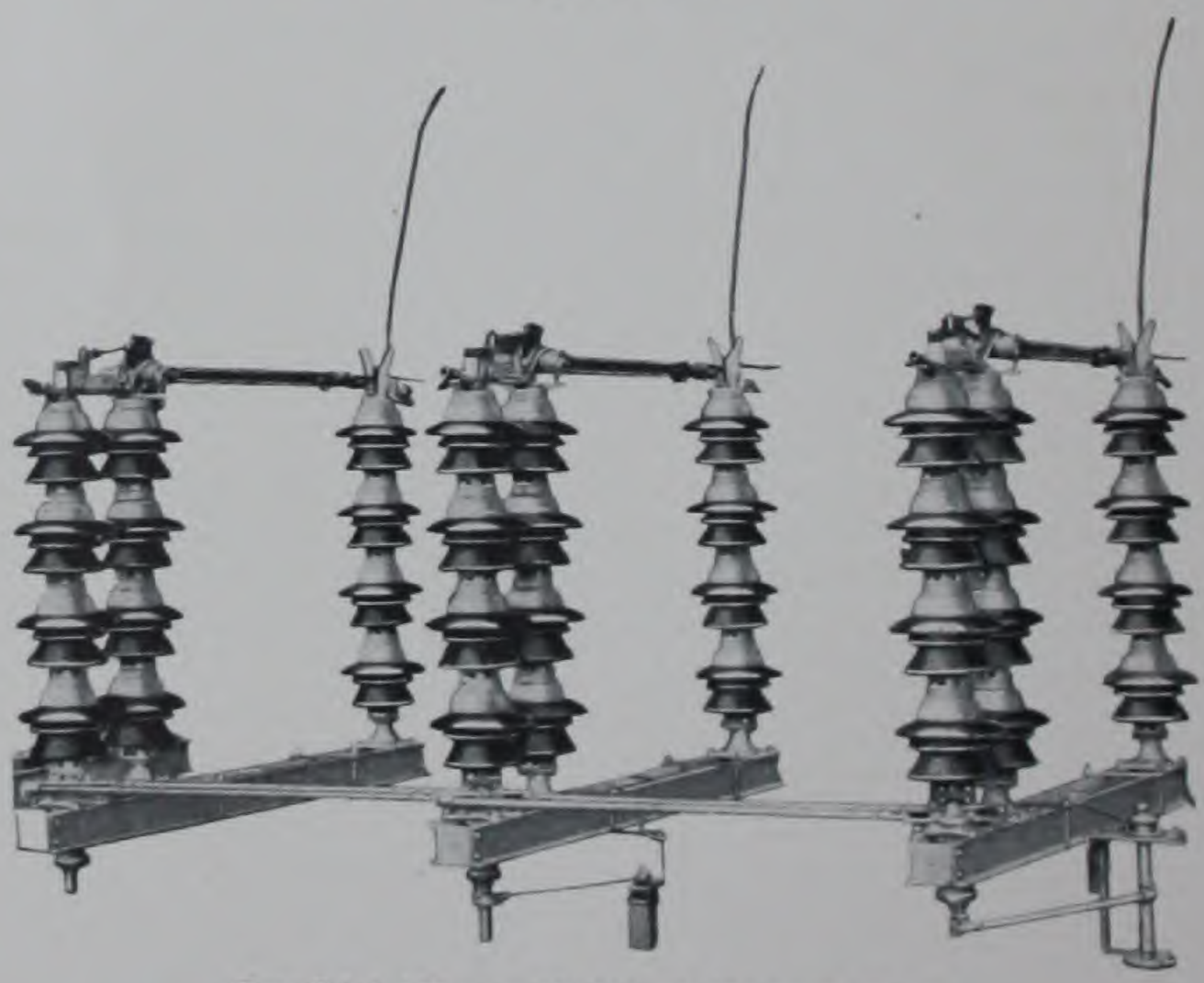
GENERAL ELECTRIC COMPANY
SCHENECTADY, N. Y.

June, 1929

GEA-1029A
Supersedes GEA-1029

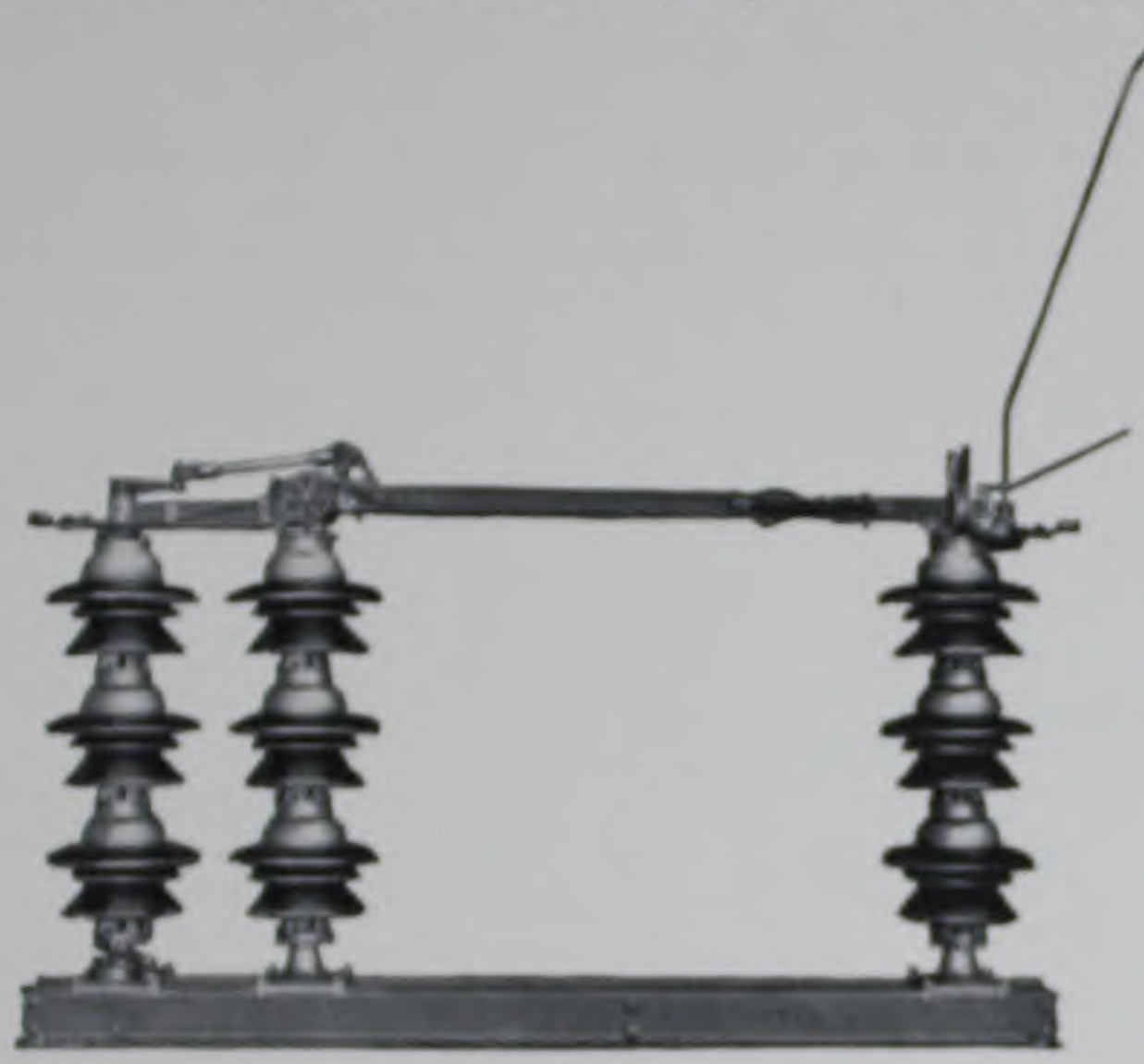


Type RA-1, 600-amp., 154,000-volt, Horn-gap Switch
in Open Position



Type RA-1, 600-amp., 154,000-volt, Horn-gap Switch
in Closed Position

Type RA-1, Group-operated, Rotating-insulator, Horn-gap Switches



Type RA-1, Single-pole, Group-operated, Horn-gap Switch, 132 Kv., 600 Amp.

TYPE RA-1 horn-gap switches are of the rotating-insulator, vertical-break construction for either disconnecting or sectionalizing service. The switches are single-throw, group-operated, and are available in either single-, double-, or triple-pole arrangements for horizontal mounting on outdoor structures. The separate poles are joined by cranks and operating pipes to obtain simultaneous operation of all poles from a single operating mechanism.

The installation of Type RA-1 horn-gap switches is extremely simple and is accomplished with minimum time and labor. It is necessary only to mount the insulators between the switch parts and base and to attach the operating pipes and operating mechanism.

FEATURES

Among the many features which make this switch so perfectly suited to outdoor service are:

1—Full-floating, spring-pressure line contacts.

2—All-copper, current-carrying path.

3—Multi-bolt, hard-drawn copper, cable terminals.

4—Arc horns which make direct contact while the switch is opening, to prevent burning of the contacts.

5—Main bearings of ball type, which take pressure in any direction.

6—Counter-balancing torsion springs, which assist operation of the switch.

7—All-steel and certified malleable-iron parts, hot-dip galvanized.

8—Corrosion-resisting pins, which prevent rusting and consequent binding of parts.

9—Manually operated mechanisms, which can be locked in open or closed position.

10—Removable operating handle of treated wood for the protection of the operator.

11—Standard G-E cemented-cap-and-pin-type insulators of the pedestal type, all insulators being interchangeable with those of the same rating and of design similar to those on other G-E outdoor devices.

Type RA-1, Group-operated, Rotating-insulator, Horn-gap Switches

12—Channel-shaped blades of truss construction with broken-back feature to assure operation under severe conditions of sleet formation.

13—Strong construction to meet exacting requirements of service and to effect minimum maintenance.

14—Simplified design—easy installation.

Contacts in Closed Position

DESIGN AND CONSTRUCTION

The design of Type RA-1 horn-gap switches incorporates all the details which experience and testing have proved essential to outdoor service. The construction is such as to provide ease and accuracy of operation.

Contacts Starting to Open

BLADE

The blade is of "broken-back" construction. It consists of two sections hinged together. This construction gives the blade a small, individual movement which produces what is known as an ice-breaking action. The movement is effective both in opening and closing and contributes considerably to the ease of switch operation.

The front, or contact, end of the blade is a short section of hard-drawn copper of ample size to obtain maximum strength and conductivity. The back, or hinged, end is a wide truss built of channel-shaped extruded metal sections with flanges facing outward. It affords great strength, rigidity, and a large radiating surface.

CONTACTS

The stationary contact of the Type RA-1 horn-gap switch is the most advanced design yet applied to outdoor switches. It is the full-floating, spring-pressure, line-contact type.

Contacts Open, Arc Horns About to Part

This type of contact consists of two large semi-cylindrical, drop-forged copper blocks, each enclosed in a malleable-iron housing which contains helical springs fitted into a recess.

Exploded View of Stationary Contacts

The housings have flared tops which guide the blade to the stationary contact. The contact blocks float on the springs and are pressed

Type RA-1, Group-operated, Rotating-insulator, Horn-gap Switches

toward each other by the spring pressure. Flexible copper braids of ample cross section provide the current paths between the contact blocks and the switch terminals.

The blade makes line contact with the contact blocks, the pressure on the blade increasing as it enters between them. The wiping action which occurs during opening and closing operations tends to clean the contact surfaces. The contact is permanently good and positive and requires no adjustment.

Sleet hoods, although not regularly furnished, are available. Their purpose is to minimize the accumulation of ice in the contacts.

TERMINALS

Multi-bolt cable terminals of hard-drawn, seamless, copper tubing are provided with all RA switches. The multi-bolt arrangement prevents loosening of the terminal connections, a condition which often occurs with single-bolt terminals because of the twisting strains encountered in service.

ARC HORNS

The arc horns are provided at both the blade and stationary contact, and are arranged to function as secondary contacts in maintaining the circuit until the blade and stationary contact have separated. The arc horns prevent burning of the main current-carrying contacts and tend to maintain an upward deflection of the arc stream during opening.

TORSION SPRINGS

Two torsion springs of chrome-vanadium steel are provided at each main hinge pin of the blade. They counterbalance the weight of the blade and prevent impact at the end of the blade travel in both opening and closing operations. This provides smooth and easy movement.

BLADE HOLDER AND CRANK

The combined blade holder and crank, in which the blade terminates, are of malleable iron. They are joined by an adjustable connecting rod through a universal joint. This construction affords high operating efficiency and minimum friction.

MAIN BEARINGS

The main bearings take pressure in any direction. They are the ball type. They are bronze-bushed, are provided with an upper and lower ball race, and have large grease pockets and alemite fittings. The top of the rotating part of each bearing is integral with the interphase operating cranks. This type of bearing gives maximum efficiency and ease of operation.

Typical Switch Insulator, 132,000 Volts

OUTBOARD BEARING

An outboard bearing is supplied when indirect switch operation is required. It is bronze-bushed, is provided with grease pocket, and is secured to

either the switch base or the supporting structure by means of adapters. It permits flexibility of installation where alternate location of the operating mechanism is desired.

INSULATORS

G-E standard pedestal-type insulators are used with these switches. They are of built-up construction, several units being used to form a complete pedestal stack for a specific rating. The units have neatly cemented, hot-dip-galvanized caps and pins. The caps and pins are ribbed to grip the cement. The porcelain is sanded at the cementing portions for the same purposes. The shells are of the best grade of wet-process porcelain, single-fired, thoroughly vitrified, and glazed a uniform chocolate color. These insulators are interchangeable with those of the same rating and design on other G-E outdoor devices. For full details of insulators, see GEA-1122.

GROUNDING SWITCH

A grounding switch is available for use with the Type RA-1. It consists of contacts mounted at the side of the RA-1 line contacts and blades pivoted directly below these contacts on the base of each RA-1 unit. The grounding switch is operated by a mechanism separate from the RA-1 mechanism but interlocks so that it can be operated only when the RA-1 switch is open.

AUXILIARY SWITCH

The auxiliary switch for use with the Type RA-1 is the standard rotary type. It is of such design that any number of control circuits up to twelve can be arranged for. The auxiliary switch is mounted within the motor-mechanism housing for motor-operated disconnecting switches, and on the disconnecting-switch supporting structure for manually operated disconnecting switches.

OPERATING MECHANISMS

Either manual or motor mechanisms are used to operate the Type RA-1. They are described in detail on page 9.

RECOMMENDATION

Experience has shown that horn-gap switches will interrupt satisfactorily the exciting current of transformer banks, and in an emergency may be used to interrupt load current. However, they are not recommended as load-break switches or for breaking line-charging current of appreciable magnitude.

Type RA-1, Group Operated, Rotating-insulator, Horn-gap Switches

PRICES, WEIGHTS, AND DIMENSIONS

88 TO 110 KV. INCL. 600 AMP.—HORIZONTAL MOUNTING*

‡ Volts	Amp	†TRIPLE SWITCH ONLY—WITHOUT MECHANISM				APPROX. DIMENSIONS IN INCHES										
		Cat. No.	§ List Price Class RRR	Approx. Ship. Wt. in Lb.	Approx. Shipment in Weeks	A	B	C	D	E	F	G	H	J	K	L
88,000	600	3633950G1	$1385.00	2175	2	95	90	48	99⅝	37½	107¼	86	3	79	1169	8
110,000		3633950G2	1605.00	2800	2	107	102	60	109½	47¼	129⅝	120	4	91		8

* The Type RA-1, 88- and 110-kv. switches can be adapted for vertical mounting, in which case the arc horns will be omitted. The switches will be known as the RA-2. Prices and dimensions on request.

† Single- or double-pole switches can be supplied. Prices furnished upon request.

‡ "Normal System" voltage rating.

§ List Price does not include operating mechanism. Select manual operating mechanism from tables on page 10.

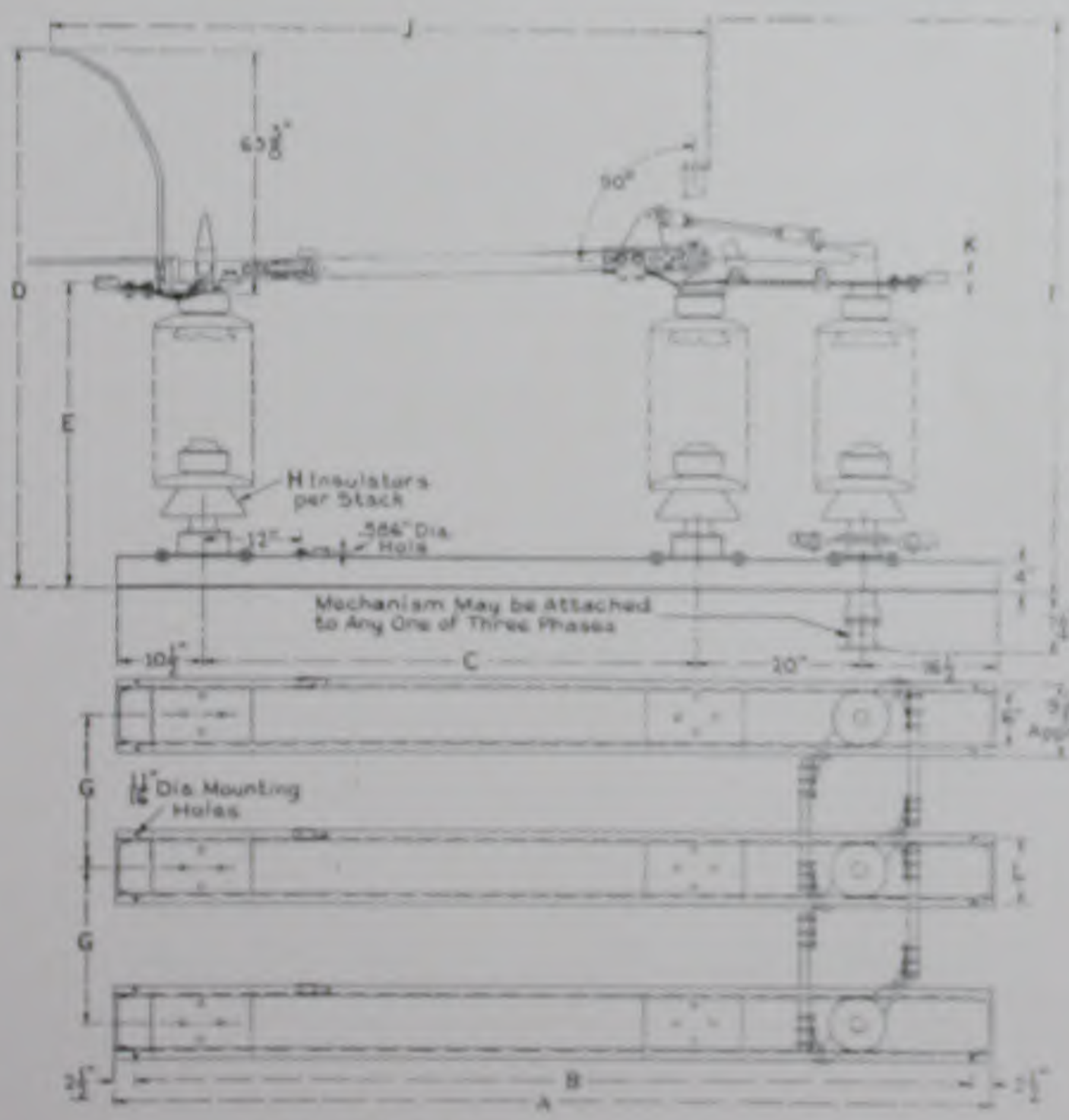
Motor mechanisms are also available. Prices and dimensions furnished upon request.

Prices and dimensions on higher-ampere-capacity switches on request.

All switches are supplied with multi-bolt, punched-tube terminals. Bolted-type clamp terminals, with or without extended guide clamps, are available for wire, cable, or I. P. S. copper tubing. See GEA-1113.

Auxiliary switches are available.

For insulators, see GEA-1122.



Single-pole Unit of Type RA-1 Switch, 88 to 110 Kv.

Type RA-1, Group-operated, Rotating-insulator, Horn-gap Switches

PRICES, WEIGHTS, AND DIMENSIONS

132 TO 154 KV. INCL. 600 AMP.—HORIZONTAL MOUNTING*

‡ Volts	Amp.	†TRIPLE-POLE SWITCH ONLY—WITHOUT MECHANISM				APPROX. DIMENSIONS IN INCHES										
		Cat. No.	§ List Price Class **RRR**	Approx. Ship. Wt. in Lb.	Approx. Shipment in Weeks	A	B	C	D	E	F	G	H	J	K	L
132,000	600	2688998G6	On Application	4000	2	113	108	72	118 3/8	56 3/4	150	144	3	103	1209	8 1/4
154,000		2688998G7		5000	2	125	120	84	132 7/8	71 1/4	176	168	4	115		8 1/4

* The Type RA-1, 132-kv. switch can be adapted for vertical mounting, in which case the arc horns will be omitted and it will be known as the Type RA-2. Prices and dimensions on request.

† Single- and double-pole switches can be supplied. Prices furnished upon request.

‡ "Normal System" operating voltage.

§ List Price does not include operating mechanisms. Select manual operating mechanism from table on page 10.

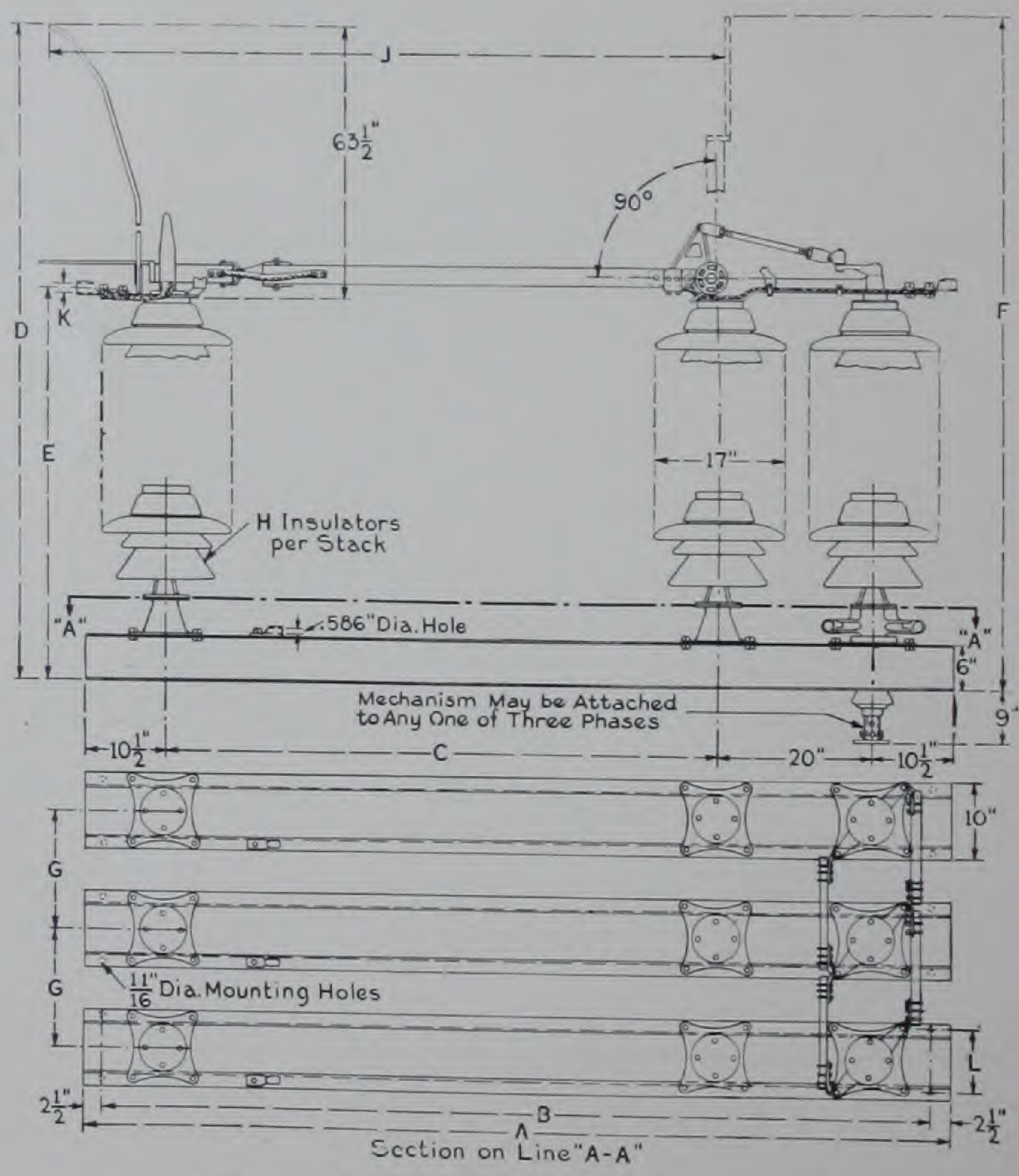
Motor mechanisms are also available. Prices and dimensions furnished upon request.

Prices and dimensions on higher-ampere-capacity switches on request.

All switches are supplied with multi-bolt, punched-tube terminals. Bolted-type clamp terminals, with or without extended guide clamps, are available for wire, cable or I. P. S. copper tubing. See GEA-1113.

Auxiliary switches are available.

For insulators, see GEA-1122.



Single-pole Unit of Type RA-1 Switch, 132 to 154 Kv.

Type RA-1, Group-operated, Rotating-insulator, Horn-gap Switches

OPERATING MECHANISMS

The operating mechanisms for the Type RA-1 horn-gap switch are designed to open and close the switch with minimum effort. They may be either the manual or motor type, depending upon purchasers' requirements. Their flexibility of mounting is such that they can be placed at the most convenient location.

Both types of mechanisms are arranged for direct or indirect operation of the switch. For direct operation, a shaft extension from one of the rotating insulators is connected by a vertical pipe to the operating mechanism directly below. For indirect operation, a crank, mounted on the shaft extension of one of the rotating insulators, is connected by a horizontal pipe to a crank on the vertical pipe which is directly connected to the operating mechanism below.

Bracket and Yoke of Operating Mechanism with Handle in Place

MANUAL MECHANISM

The manual mechanism is a lever with a removable treated-wood handle. The handle is rotated 120 degrees in a horizontal plane to effect switch operation. The handle is of wood for operators' protection and is provided with a locking pin to prevent its falling from the socket. The bracket is arranged for either vertical or horizontal mounting and provides a means of padlocking the lever in either the open or closed position.

MOTOR MECHANISM

The motor mechanism used with these switches is of the high-speed, high-torque, heavy-duty type and is designated as the Type MP-1. The motion of the motor is transmitted to a gear arrangement and then through a cam lever to a crank on the mechanism housing. The alternate upward and downward movement of the crank operates the switch through a vertical operating pipe which has a gear arrangement near its upper end to produce rotation of the rotating insulator.

Motor Mechanism
Showing Operating Crank and Pipe Clevis
(Cranks and Couplings not Shown)

The cam produces relatively high torque and relatively low speed at the beginning of the stroke, the speed increasing up to mid-position, at which point it decreases. The switch blades are thus put into motion and stopped without shock. A rest, or dwell, provided in the stroke, prevents overtravel of the operating crank because of motor overrun. This assures a definite position of the switch blades at the completion of each operation.

A removable wooden operating handle is provided with each motor mechanism to permit emergency operation. A ratchet connection between the gear arrangement and the cam permits emergency operation independently of the motor.

The motor mechanism is enclosed in a weatherproof housing which may be mounted in the most convenient location.

Type RA-1, Group-operated, Rotating-insulator, Horn-gap Switches

OPERATING MECHANISMS

PRICES, WEIGHTS, AND DIMENSIONS

Type	RATING OF SWITCH		Cat. No.	* List Price Class **RRR**	Approx. Ship. Wt. in Lb.	Approx. Shipment in Weeks.	Fig. No. Page 10	APPROX. DIMENSIONS IN INCHES		
	Volts	Amp.						A	X	Y
DIRECT	88,000	600	3815655G1	**$25.00**	35	2	1	8	Determined by Purchaser	Determined by Purchaser
	110,000	600	3815655G1	**25.00**	35	2	1	8		
	132,000	600	3815655G1	**25.00**	35	2	1	9		
	154,000	600	3815655G1	**25.00**	35	2	1	9		
INDIRECT	† 88,000	600	3815655G2	**45.00**	45	2	2	8		
	† 110,000	600	3815655G2	**45.00**	45	2	2	8		
	† 88,000	600	3815655G3	**50.00**	65	2	3	9		
	† 110,000	600	3815655G3	**50.00**	65	2	3	9		
	132,000	600	3815655G3	**50.00**	65	2	3	9		
	154,000	600	3815655G3	**50.00**	65	2	3	9		

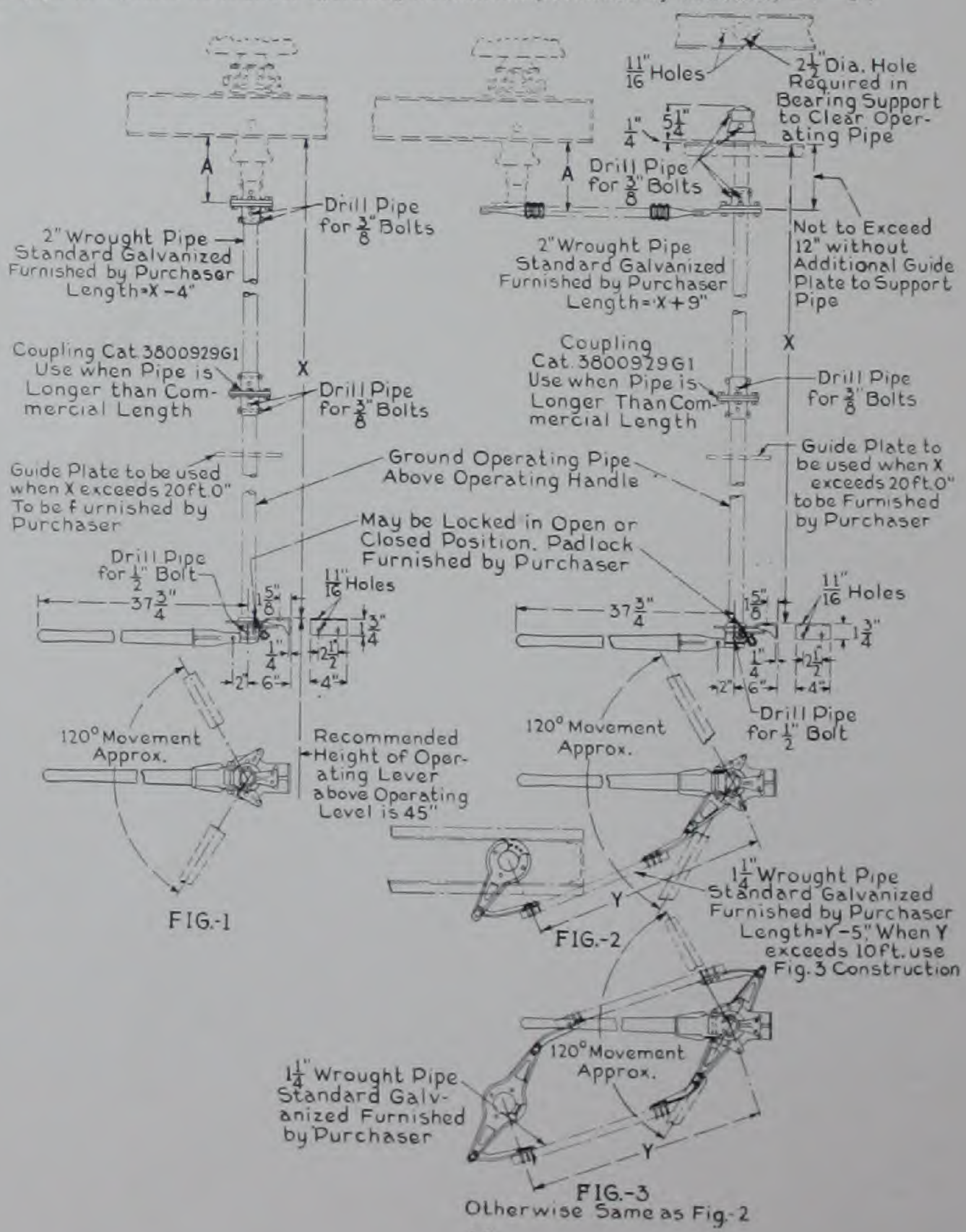
* Prices do not include galvanized pipe for connection from operating handle to switch.

† Use mechanism 3815655G2 when "Y" is 10 feet or less. See illustration below.
Use mechanism 3815655G3 when "Y" is more than 10 feet.

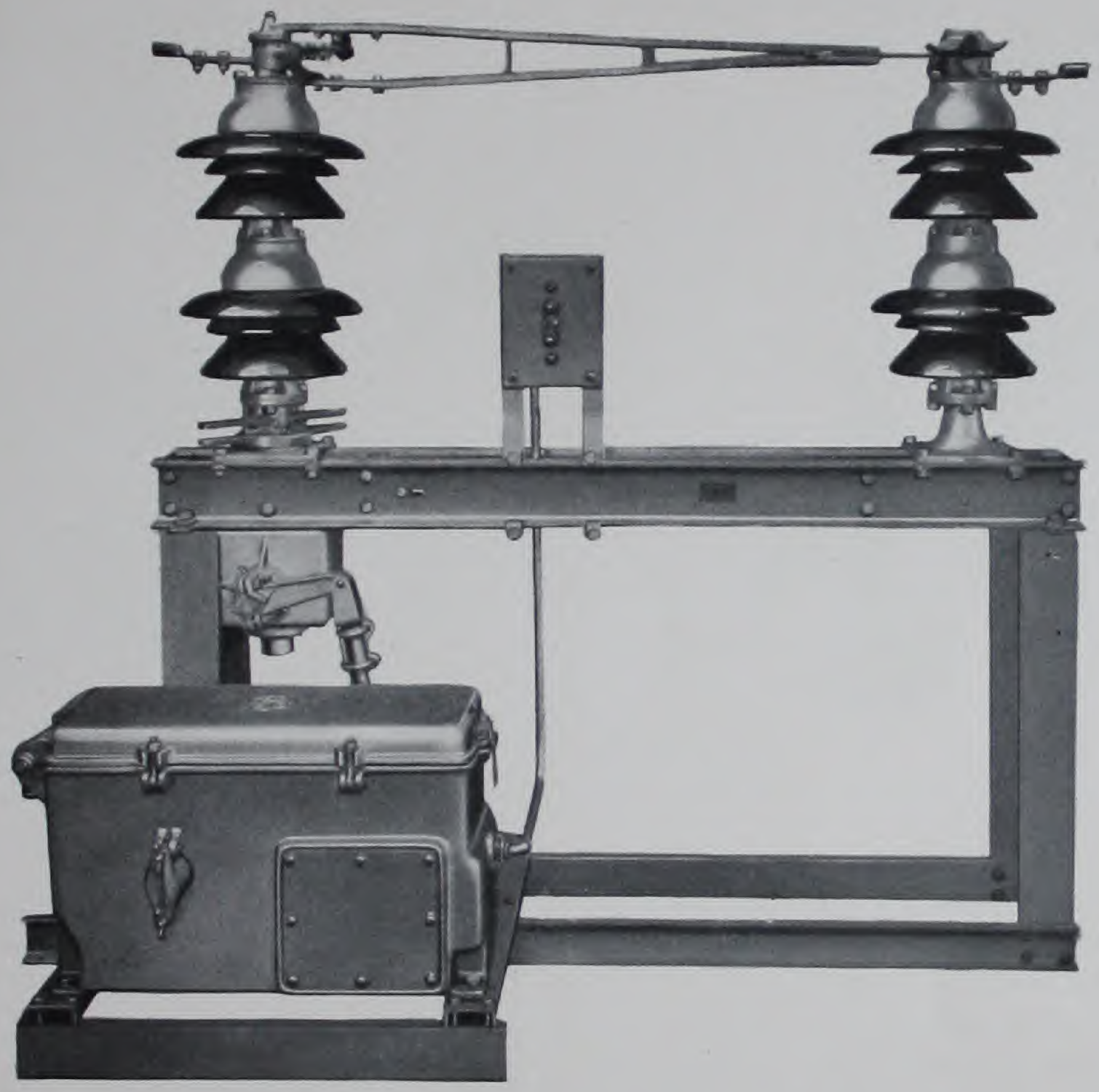
For pipe coupling, Cat. No. 3800929G1, required when operating pipe is longer than commercial length, increase List Price of mechanism $8.00.

NOTE.—Length of 2-in. operating pipe (furnished by customer) { Direct mechanism = X—4" / Indirect mechanism = X + 9"

Length of 1¼-in. pipe connection on indirect operating mechanism (furnished by customer) = Y—5".



Type RK, Group-operated, Rotating-insulator, Disconnecting Switches



Single-pole Element of Type RK-6 as Arranged for Exhibit Purposes

The Type RK group-operated, rotating-insulator, horizontal-break, disconnecting switches are available in single or double break for horizontal upright or horizontal under-hung mounting. The available ratings are 88 to 220 kv., 600 amperes.

These switches are particularly suited to outdoor service because of their many valuable features, a few of which are here listed.

1—Full-floating, spring-pressure, line contacts.

2—Truss-constructed blade of channel-shaped copper bar.

3—Broken-back design of blade provides ice-breaking action.

4—Interchangeable insulators of the cemented-cap-and-pin type.

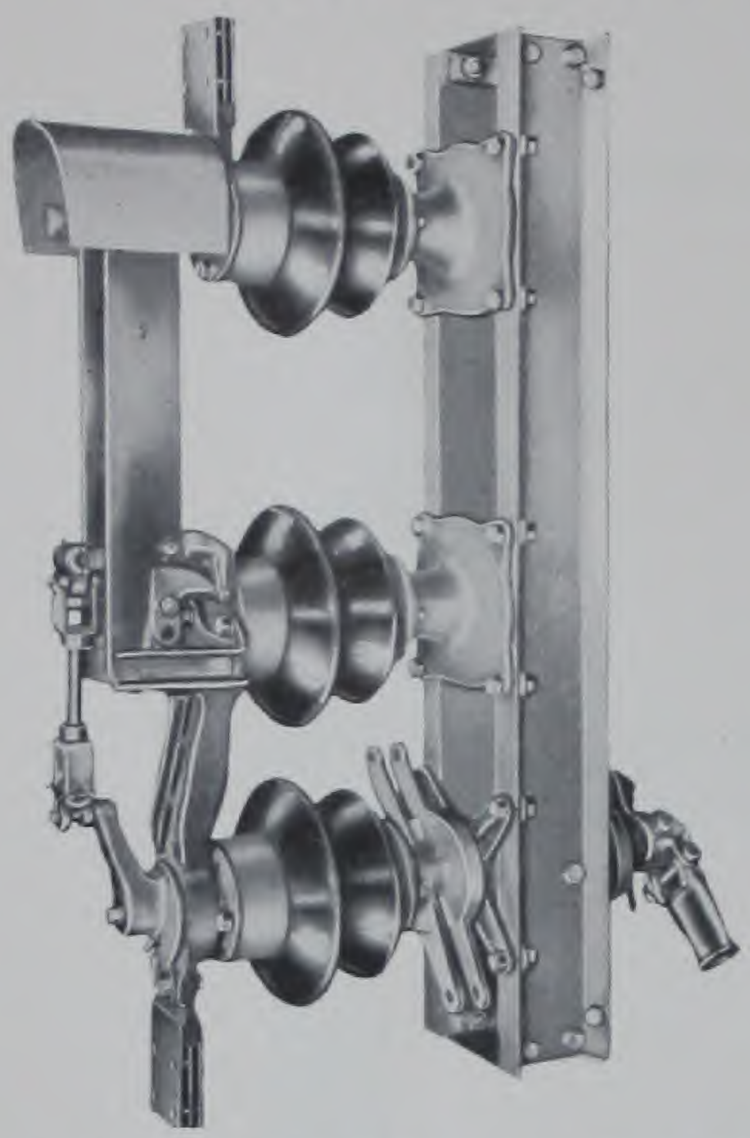
5—Radial and thrust main ball bearings.

6—Corrosion-resisting pins prevent binding of parts.

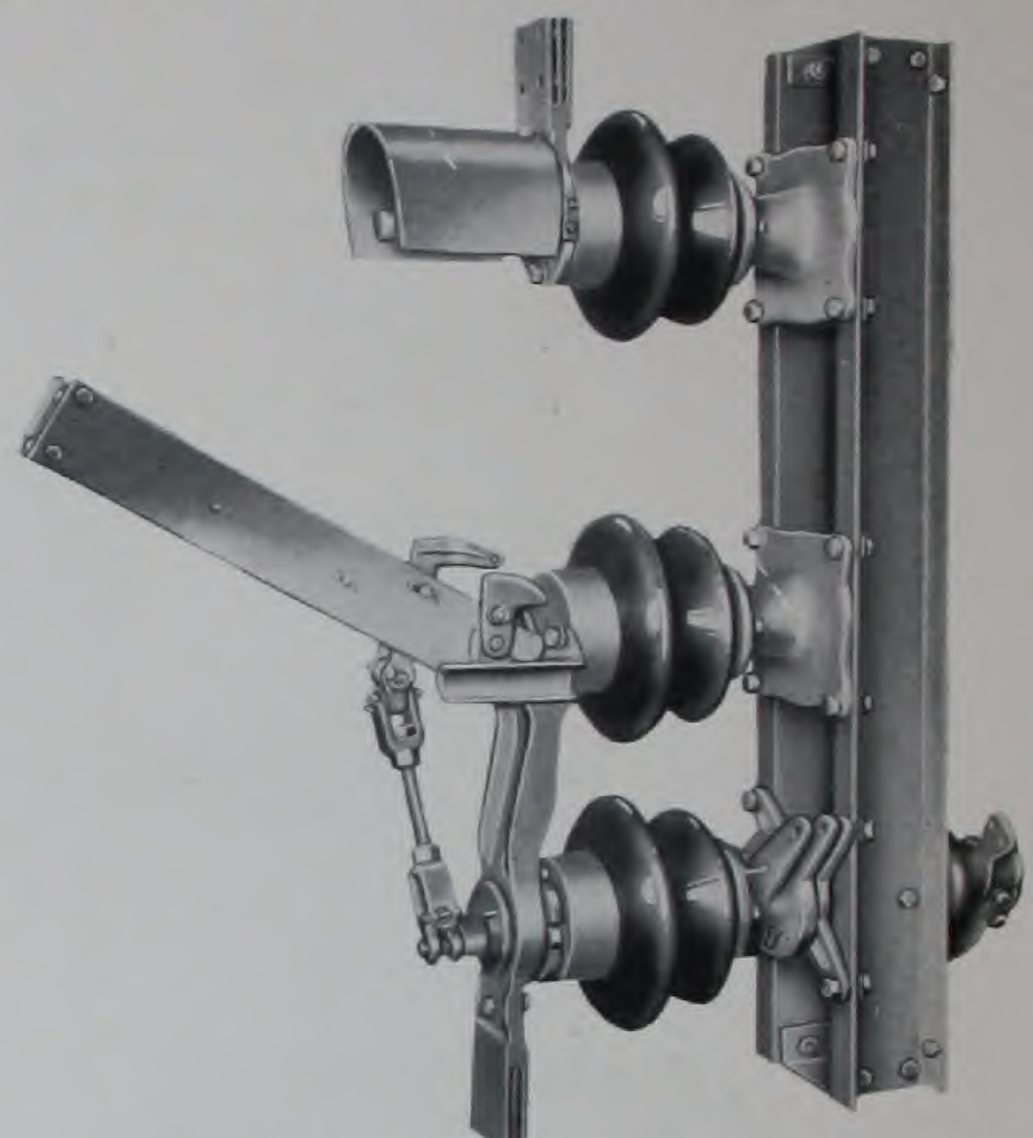
7—Hot-dip galvanized steel parts.

8—Easy operation and simplified installation.

Type RP, Group-operated, Rotating-insulator, High-current, Disconnecting Switches



Single-pole Element of the 3000-ampere Type RP-2 in Closed Position



Single-pole Element of the 3000-ampere Type RP-2 in Open Position

For high-current outdoor service, no disconnecting switch is better qualified than the Type RP. This switch incorporates those features which operating practice and years of progressive research prove essential to disconnecting switches for heavy currents.

This switch is group-operated and of vertical-break, rotating-insulator construction. It makes use of a wedge-and-plunger arrangement which produces high pressure of the blade against both the hinge and contact ends.

Operation of the Type RP is effected with exceptional ease, and in one movement of the mechanism. The wedges which apply the pressure cannot function until the blade is closed.

The ratings are 7500, 15,000, 25,000, 37,000, and 50,000 volts; 2000, 3000, and 4000 amperes.

June, 1929 (10M)

GENERAL ELECTRIC COMPANY

GENERAL OFFICE SCHENECTADY, N. Y.

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NEW ZEALAND: National Electrical and Engineering Company, Ltd., Auckland, Dunedin, Christchurch, and Wellington
PARAGUAY: General Electric, S. A., Buenos Aires, Argentina
PERU: W. R. Grace & Company, Lima
PHILIPPINE ISLANDS: Pacific Commercial Company, Manila
PORTO RICO: International General Electric Company of Porto Rico, San Juan
PORTUGAL AND COLONIES: Sociedade Iberica de Construcoes Electricas Ltda., Lisbon
SOUTH AFRICA: South African General Electric Company, Ltd., Johannesburg, Capetown, Durban, and Port Elizabeth
SPAIN AND COLONIES: Sociedad Iberica de Construcciones Electricas, Madrid, Barcelona, and Bilbao
SWITZERLAND: Trolliet Freres, Geneva
URUGUAY: General Electric, S. A., Montevideo
VENEZUELA: General Electric, S. A., Caracas and Maracaibo

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